

## **Technical and Functional Requirements**

# **Requirements (Customer, Project, and System) for the OU 7-13/14 In Situ Grouting Project**



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OU 7-13/14 ISG Project	Technical and Functional Requirements	For Additional Info: <a href="http://EDMS">http://EDMS</a>	Effective Date: 9/30/04

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## **1. INTRODUCTION**

### **1.1 Facility Modification Identification**

The requirements defined in this technical and functional requirements (T&FR) document support the acquisition of in situ grouting services for the Subsurface Disposal Area (SDA) of the Radioactive Waste Management Complex (RWMC) at the Idaho National Engineering and Environmental Laboratory (INEEL).

### **1.2 Limitations of the T&FR**

This T&FR document defines the customer, project, and derived system requirements for the OU 7-13/14 In Situ Grouting Project. The engineering design studies for this project span aspects of preconceptual design, conceptual design, and detailed design.

### **1.3 Ownership of T&FR**

The project engineer assigned to the OU 7-13/14 In Situ Grouting Project owns this document and is responsible for any changes.

## **2. OVERVIEW**

This document collects the customer, project, and derived system requirements for the OU 7-13/14 In Situ Grouting Project. This document was initiated, prepared, reviewed, and approved using MCP-9185, "Technical and Functional Requirements." MCP-9185, Appendix B, "T&FR Outline," was used as a guide and modified as needed to meet project specifics. This document is controlled using MCP-135, "Creating, Modifying, and Canceling Procedures and Other DMCS-Controlled Documents."

### **2.1 Facility, Structure, System, Component Functions**

The systems shall be capable of providing grout and injecting it into the ground at specified locations.

## **3. REQUIREMENTS AND BASES**

The requirements shall be validated during project team and design team meetings. The requirements shall be verified against the engineering design files (EDFs) using the MCP-9217, "Design Verification," process and by the review of ICP/EXT-04-00525, *Engineering Studies Report for the OU 7-13/14 In Situ Grouting Project*, using an operations review board (ORB) per MCP-135, "Creating, Modifying, and Canceling Procedures and Other DMCS-Controlled Documents."

Each requirement has an unique identifier.

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### **3.1 Special Requirements**

#### **3.1.1 Radiation and Other Hazards**

The drill string shall be provided with contamination controls to prevent personnel contamination from grout splatter. (00001)

Engineered controls shall be provided at the injection points to prevent personnel or equipment contamination. (00003)

Air sampling or monitoring system shall be provided around the injection points to monitor particulate and gas releases. (00002)

System shall be designed to comply with the requirements of 10 CFR 835, "Radiation Protection." This shall include requirements for portable personnel airborne monitoring equipment, portable personnel exposure monitoring equipment, and portable personnel contamination control equipment. (00036)

### **3.2 Engineering Design Requirements**

#### **3.2.1 Mechanical and Materials**

Selected grouts for contaminant grouting and foundation grouting shall be compatible with the high-pressure in situ grouting system as determined by density, suspension, particle size, set time, viscosity, shrinkage, heat generation, and application safety. (00004)

Contaminant grout monoliths are desired and adjacent grout columns shall overlap or be contiguous. (00005)

Contaminant grouted waste monoliths shall resist subsidence from external and internal conditions. (00006)

Contaminant grout monoliths shall resist leaching of the contaminants of concern due to biodegradation, radiation degradation, and/or water filtration during the life span of the cap. (00007)

Contaminant grouted waste monoliths shall be compatible with the waste matrix and not induce accelerated release of contaminants. (00008)

Foundation grouted columns shall resist subsidence from external and internal conditions. (00010)

Foundation grouted columns shall resist physical degradation due to biodegradation, radiation degradation, and/or water infiltration during the life span of the cap. (00011)

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Foundation grouted columns shall be compatible with the waste matrix and not induce accelerated release of contaminants. (00013)

All mechanical components shall be capable of meeting specified performance at an elevation of 5,000 feet above sea level. (00037)

The system shall include features in the design to facilitate deactivation, decontamination, and decommissioning of all components and equipment. (00038)

### **3.2.2 Electrical Power**

All electrical components shall be capable of meeting specified performance at an elevation of 5,000 feet above sea level. (00039)

### **3.2.3 Instrumentation and Control**

The capability shall be provided to locate the drill injection position on the surface to within +/- 1 foot relative to the map coordinates. It shall be possible to record manually and remotely the location using commercially available equipment. (00014)

The capability shall be provided to measure the vertical position of the injection pipe down-hole to within +/- 1 foot. It shall be possible to record manually and remotely the vertical position using commercially available equipment. (00015)

The capability shall be provided to measure the depth of the drill penetration from the start of grouting position to within +/- 1 foot. It shall be possible to record manually and remotely the depth of penetration using commercially available equipment. (00016)

The capability shall be provided to measure the depth of the end of grouting position to within +/- 1 foot. It shall be possible to record manually and remotely the grouting depth using commercially available equipment. (00017)

The capability shall be provided to measure the volume of grout injected at any hole to within +/- 10 gallons. It shall be possible to record manually and remotely the volume of grout using commercially available equipment. (00018)

The capability shall be provided to measure (visually attained qualitatively rough order of magnitude) the volume of grout returns on the surface. It shall be possible to record manually and remotely the volume using commercially available equipment. (00019)

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### **3.3 Testing and Maintenance Requirements**

#### **3.3.1 Testability**

Cold demonstration of grout equipment and procedures will be necessary in a nonradioactive, nonhazardous environment. (00041)

All components shall be maintained in a stable and known condition from the post-shutdown layup period until deactivation, decontamination, and decommissioning. (00044)

### **3.4 Other Requirements**

#### **3.4.1 Quality Assurance**

Quality controls shall be applied commensurate with risk, function, and importance of the system and its components. (00045)

Quality assurance procedures and processes (contractor-approved) shall be applied. (00046)

The system shall be designed to allow regular subcontractor inspection of major subsystems and components. (00047)

The system shall be designed, procured, and used based on five products:

1. Requirements set
2. Design package
3. Design verification package
4. Fabrication package
5. Product verification package. (00048)

Data required to verify that remediation objectives—as defined by the engineering evaluation/cost analysis and the action memorandum—are met shall be procurement quality level 3. (00053)

Instruments that generate environmental data shall be purchased at procurement quality level 3. (00054)

All other procured services and materials shall be obtained at procurement quality level 4. (00049)

### **3.5 Project Requirements**

The system shall be demonstrated at the INEEL prior to use. (00020)

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Contaminant grouting shall be conducted in applicable SDA pits, trenches, and soil vault rows to reduce or eliminate the migration of contaminants of concern (carbon 14, iodine 129, technetium 99, and uranium). (00021)

Contaminant grouting shall be conducted from the basalt layer or drill stem refusal to the interface of the waste and overburden interface. (00022)

Contaminant grouting scope shall include Pits 7, 8, 13, 14, 15, and 16. (00023)

Contaminant grouting scope shall include Soil Vault Rows 1 through 21, except beryllium block soil vault locations grouted during fiscal year 2004. (00024)

Contaminant grouting scope shall include Trenches 11 through 58, except beryllium block trench locations grouted during fiscal year 2004. (00025)

Foundation grouting shall be conducted in applicable SDA pits, trenches, and soil vault rows to prevent subsidence and possible breach of a future cap. (00027)

Foundation grouting shall include in situ jet grouting in selected waste areas to form support columns. (00028)

Foundation grouting scope shall include Trenches 1 through 10, with the following exceptions:

- Trench areas that are contaminant grouted
- Retrieved areas within trenches
- Trench areas where it is determined that additional foundation enhancement for the future cap is not required. (00029)

Foundation grouting scope shall include Pits 1, 2, 3, 4, 5, 6, 9, 10, 11, and 12, with the following exceptions:

- Pit areas that are contaminant grouted
- Retrieved areas within pits
- Pit areas where it is determined that additional foundation enhancement for the future cap is not required. (00030)

Future foundation grouting scope shall include Pits 17, 18, 19, and 20 (active low-level pits) after closure, with the following exceptions:

- Pit areas that are contaminant grouted
- Retrieved areas within pits



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- Pit areas where it is determined that additional foundation enhancement for the future cap is not required. (00031)

The system shall operate under the Department of Energy nuclear safety requirements established in 10 CFR 830 Subpart B, "Safety Basis Requirements," Department of Energy orders, and contractor program requirements documents and management control procedures. This shall be documented in an addendum to the Radioactive Waste Management Complex Safety Analysis Report (SAR-4), which will address this project. (00032)

The system shall operate under the *Project Execution Plan for the In Situ Grouting Project* (ICP/EXT-04-00420) when it is approved. In the interim, the *Conceptual Design Plan for the OU-7-13/14 In Situ Grouting Project — Phase 2* (ICP/EXT-03-00039) shall take precedence if there is conflicting information, and the *Idaho Completion Project Project Execution Plan* (INEEL/EXT-03-00387) shall also be used. (00033)

In situ grouting shall be conducted as a Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Section 104 non-time-critical removal action. (00034)

In situ grouting project shall be able to interface with ongoing activities at the SDA, such as low-level waste disposal, the Accelerated Retrieval Project, and the Organic Compound Vadose Zone Project. (00035)

The system shall be designed to comply with the health and safety requirements under the INEEL health and safety programs. (00037)

The project shall not provide any additional flooding protection. (00051)

#### 4. REFERENCES

10 CFR 830 Subpart B, "Safety Basis Requirements"

10 CFR 835, "Radiation Protection"

ICP/EXT-03-00039, *Conceptual Design Plan for the OU-7-13/14 In Situ Grouting Project — Phase 2*

ICP/EXT-04-00420, *Project Execution Plan for the In Situ Grouting Project*, draft document

ICP/EXT-04-00525, *Engineering Studies Report for the OU 7-13/14 In Situ Grouting Project*

INEEL/EXT-03-00387, *Idaho Completion Project Project Execution Plan*

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MCP-135, "Creating, Modifying, and Canceling Procedures and Other DMCS-Controlled Documents"

MCP-9185, "Technical and Functional Requirements"

MCP-9217, "Design Verification"

SAR-4, "Radioactive Waste Management Complex Safety Analysis Report"